Mining Twitter Data to Augment NASA GPM Validation

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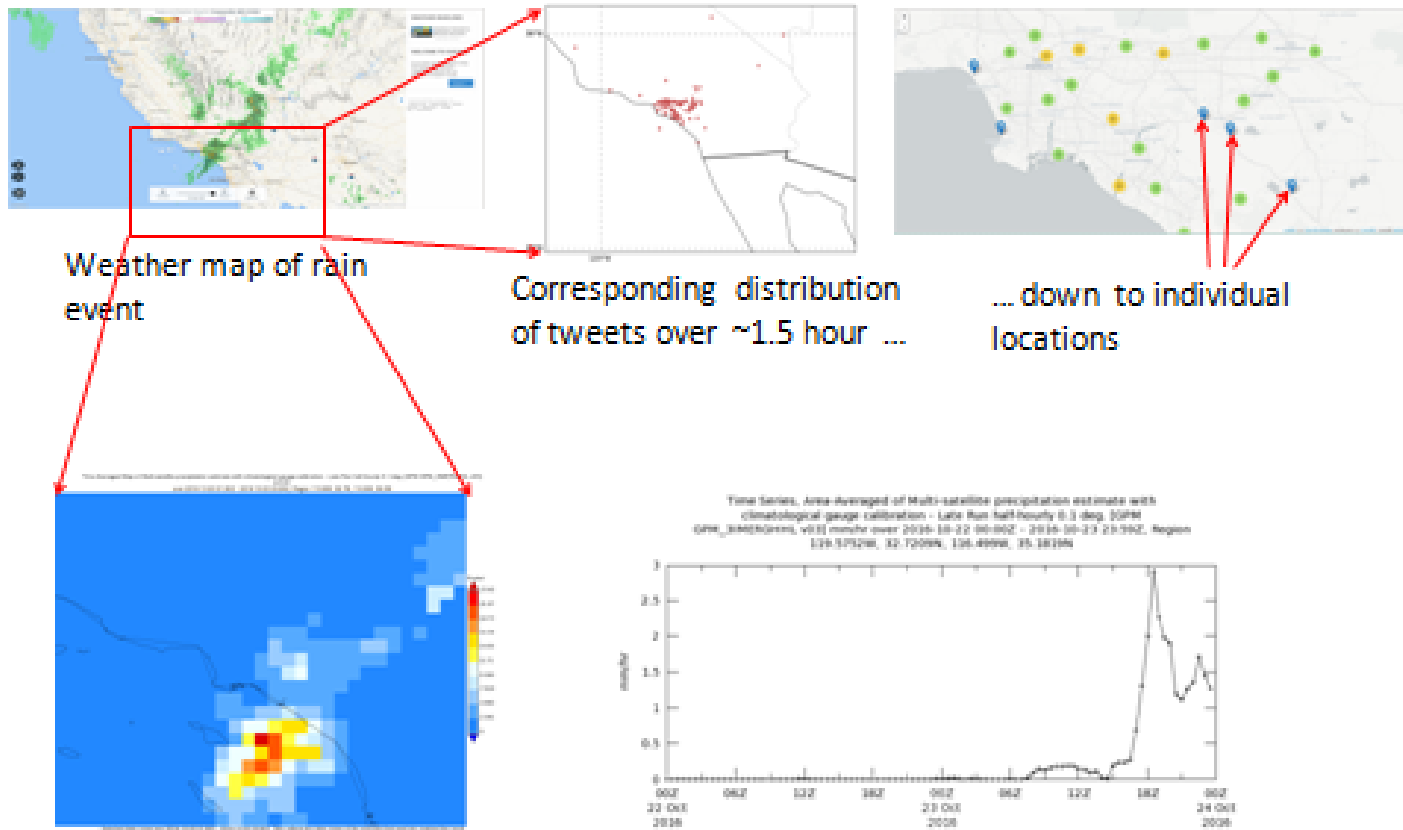
[1]NASA GSFC 610.2; [2]ADNET Systems, Inc.; [3]NASA GSFC 612

NASA CSESP (NNH16ZDA001N)

AGU 2017 Fall Meeting, Dec. 14, 2017

Motivation

Rain event in Los Angeles area

Weather map of rain event

Corresponding distribution of tweets over ~1.5 hour ...

... down to individual locations

NASA Giovanni visualization of GPM map (left) and time series (right) of the LA area rain event

Organic network of rain gauges

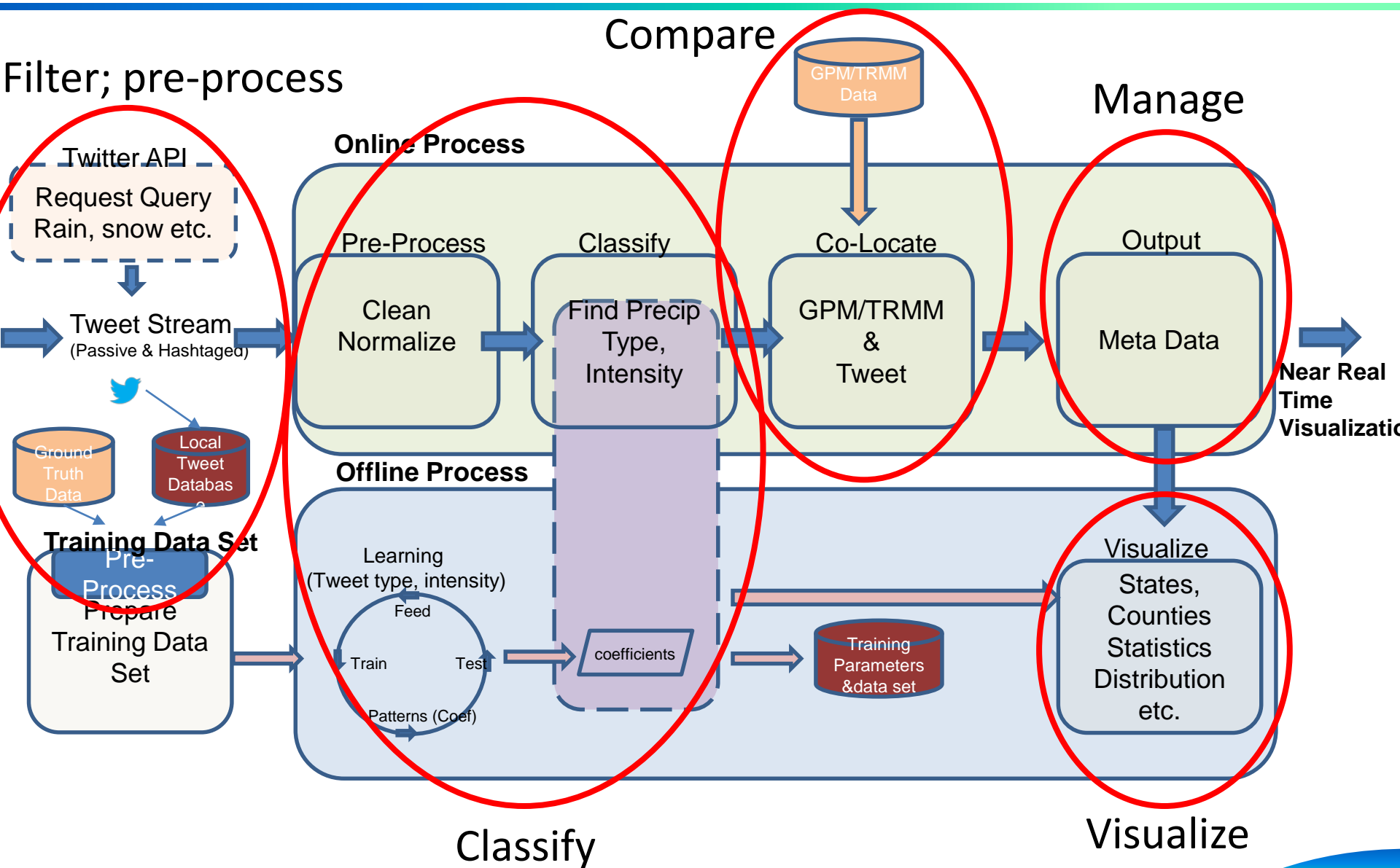**Space-time-varying set of "precipitation tweets"**

➤ **Reading the "gauge measurements"**
  ➤ **Develop infrastructure for processing and analyzing tweets**
➤ Enhancing quality of tweets; engaging with "active" participants
➤ Applying processed tweets to satellite data validation
➤ Managing tweet data

Tweet processing infrastructure

Example tweets

Relevant tweet
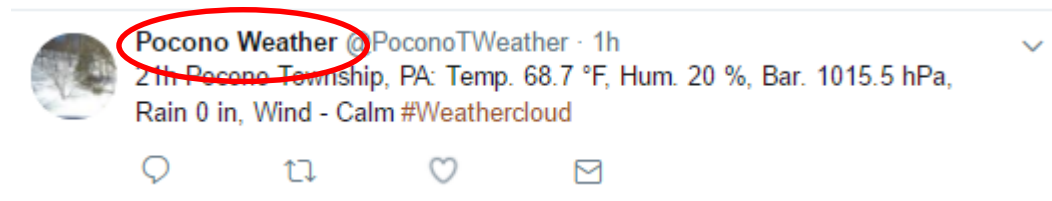
Not relevant tweet

Weather station tweet

Tweet text

User info

Geo-tag info

Map of a Twitter Status Object
Raffi Krikorian <raffi@twitter.com>
18 April 2010

Approach to crowd-sourcing

➢*Not* require participants to explicitly "sign up" to contribute.

➢To effectively crowd-source, a large source of crowd is needed.

➢Twitter is such a source.

March 2017 winter storm
Number of tweets collected
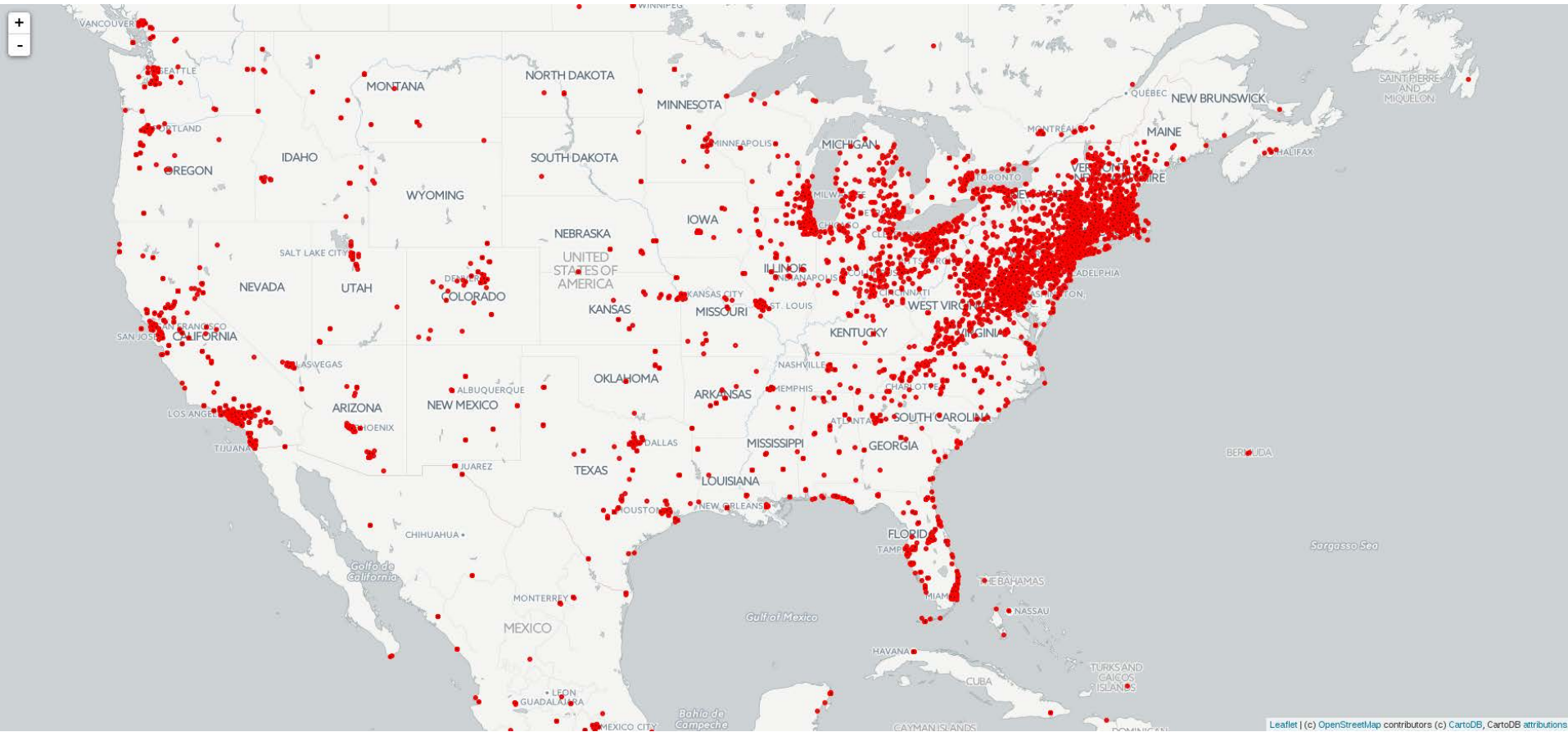
Start: 2017-03-13 22:23:12 – End: 2017-03-14 19:05:31

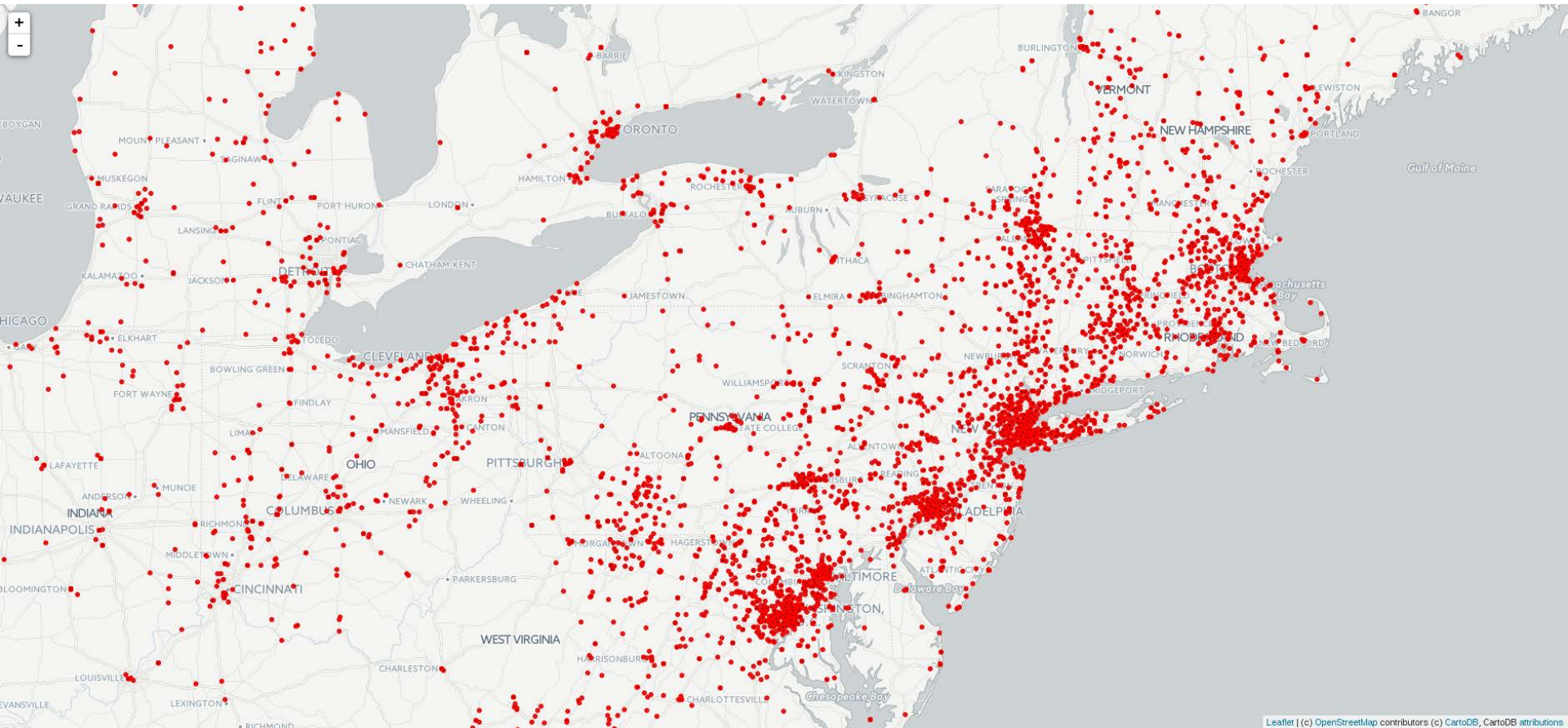|	Total # tweets	# tweets w/ geo-location	# tweets w/ geo-tag (place)
Global	1,227,390	22,880	34,535
U.S.		13,269	20,349

March 2017 snow event
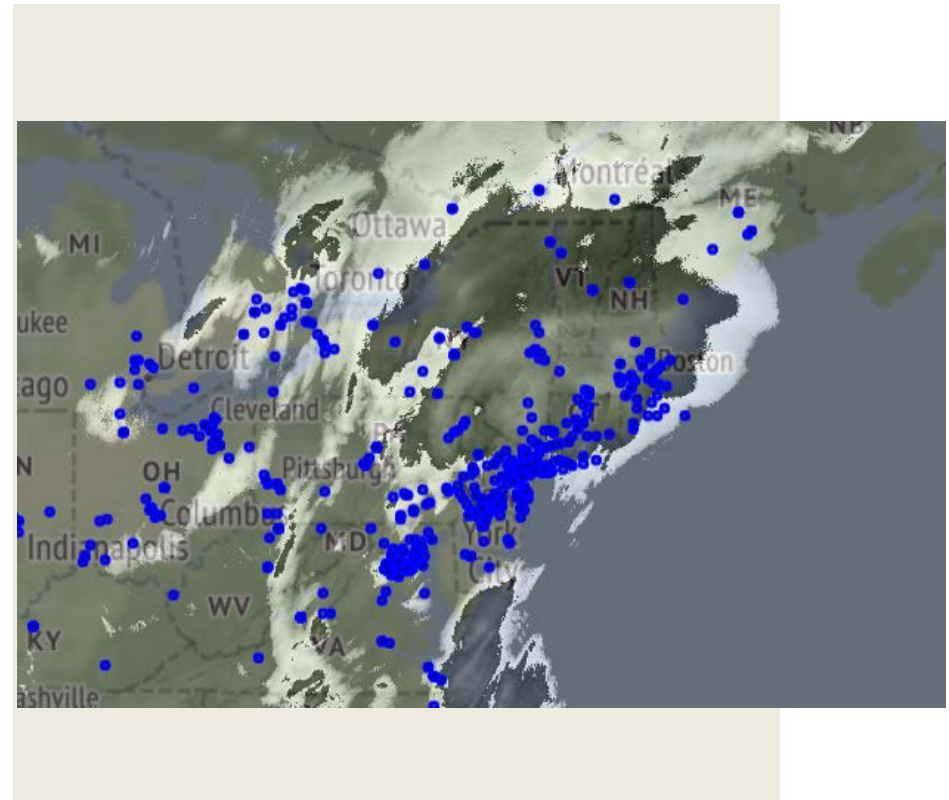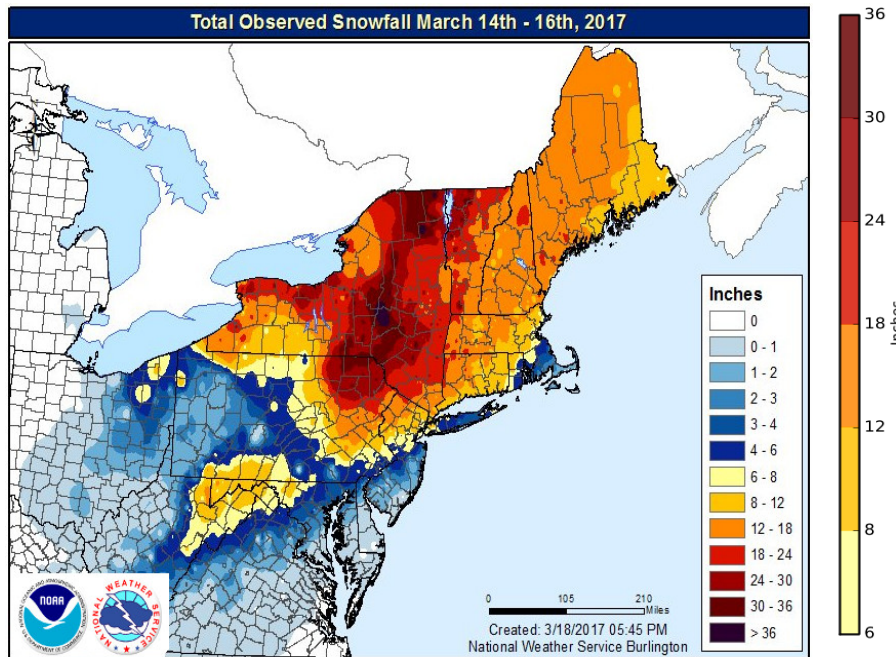## Distribution of tweets

March 2017 snow event
Distribution of tweets

March 2017 winter storm

Observed snowfall & MRMS*-tweet map

Total Observed Snowfall March 14th - 16th, 2017

*Multi-Radar/Multi-Sensor System (NOAA NSSL)

Comparing tweets with MRMS

➢Analysis ongoing; thus far, majority of MRMS-tweet pairs agree (i.e., m1/t1, m0/t0).
➢Many "passive" tweets are "regular" (e.g., from amateur weather stations), e.g.,
  ➢Wind 0.0 km/h N. Barometer 1006.7 mb, Falling. Temperature 8.3 °C. Rain today 8.8mm. Humidity 93%
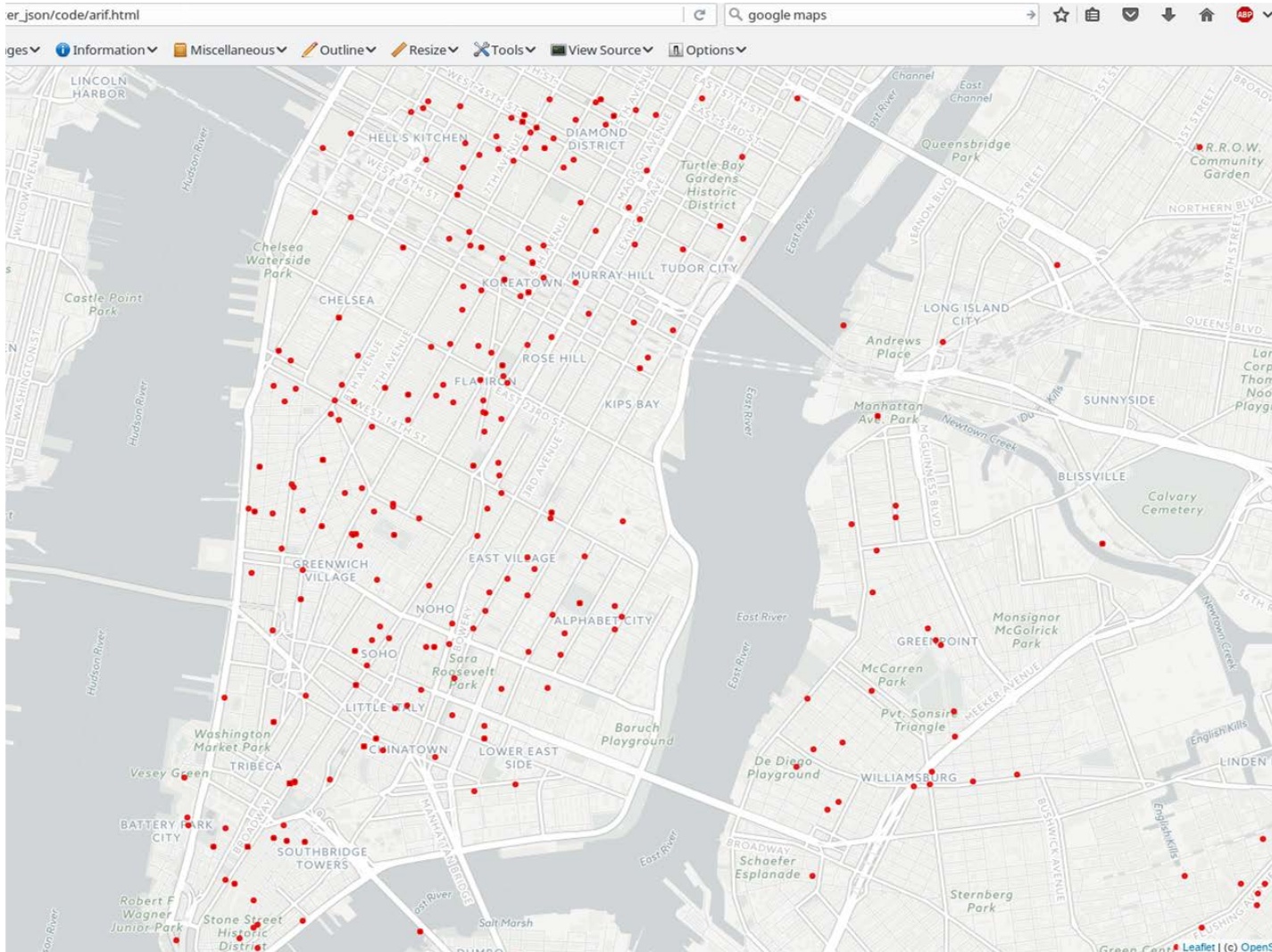➢Implication for quality of "passive" tweets.

March 2017 snow event
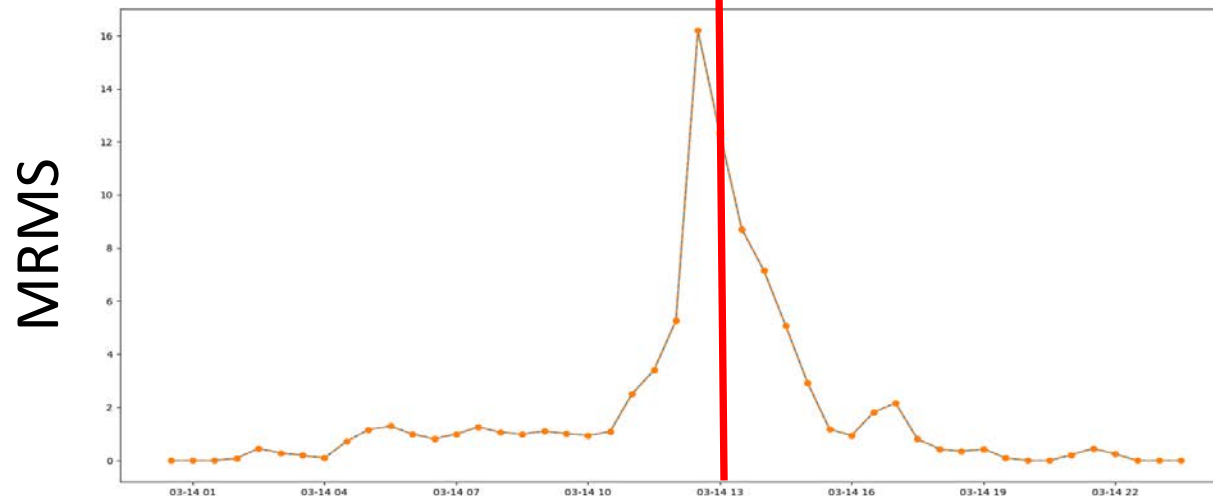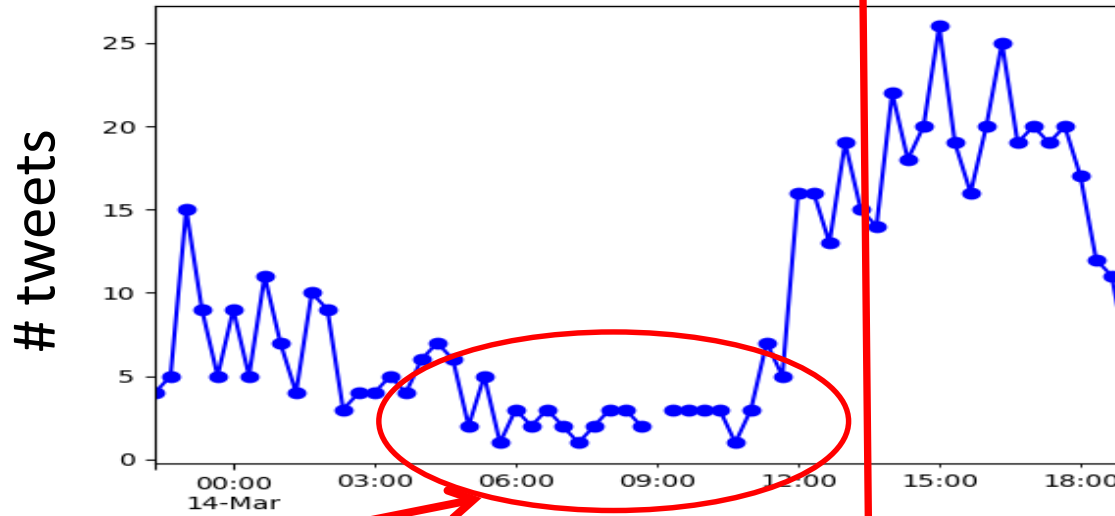## Time-varying # of tweets
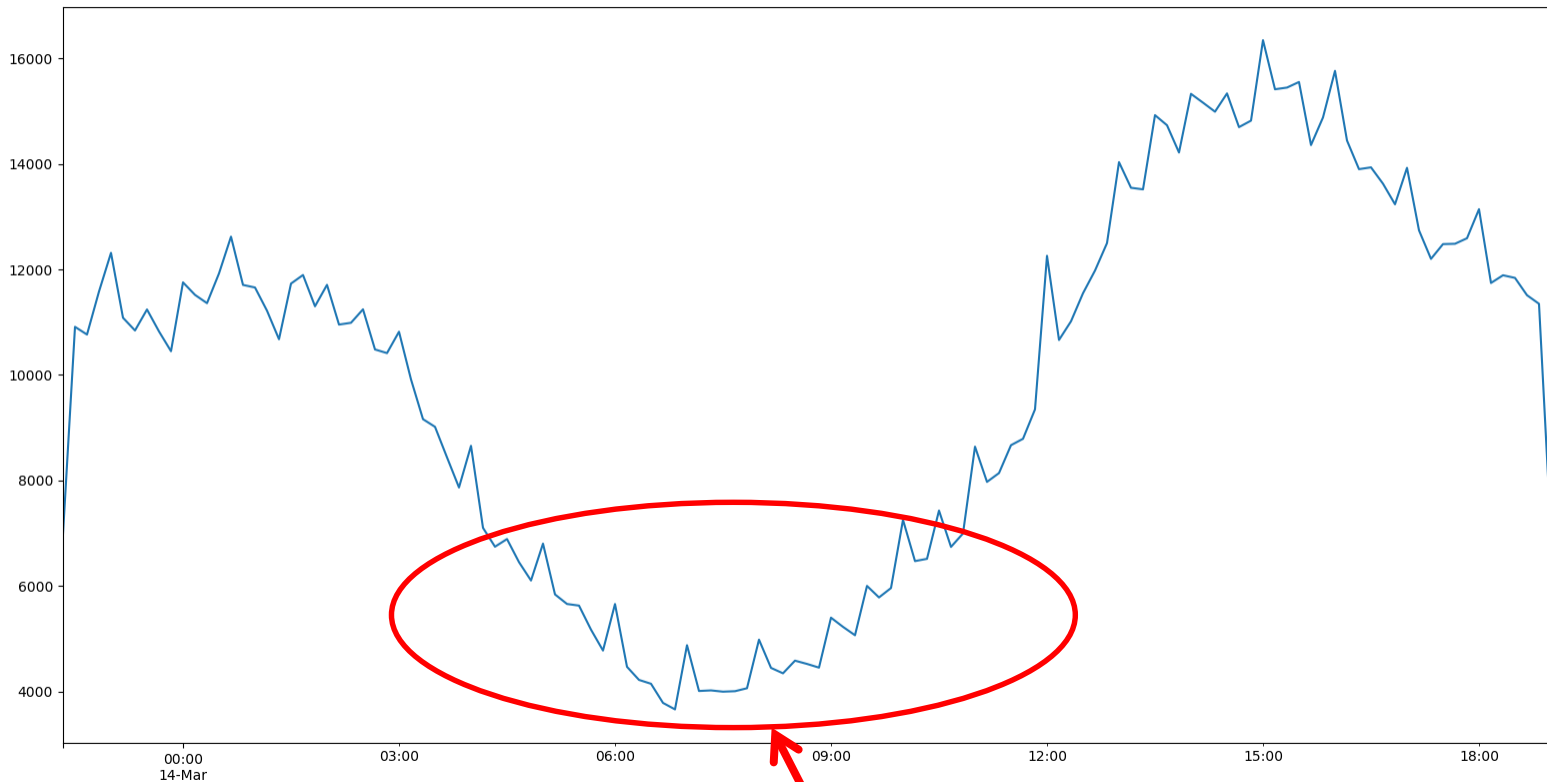
~Midnight – 6 am, U.S. east coast

March 2017 snow event
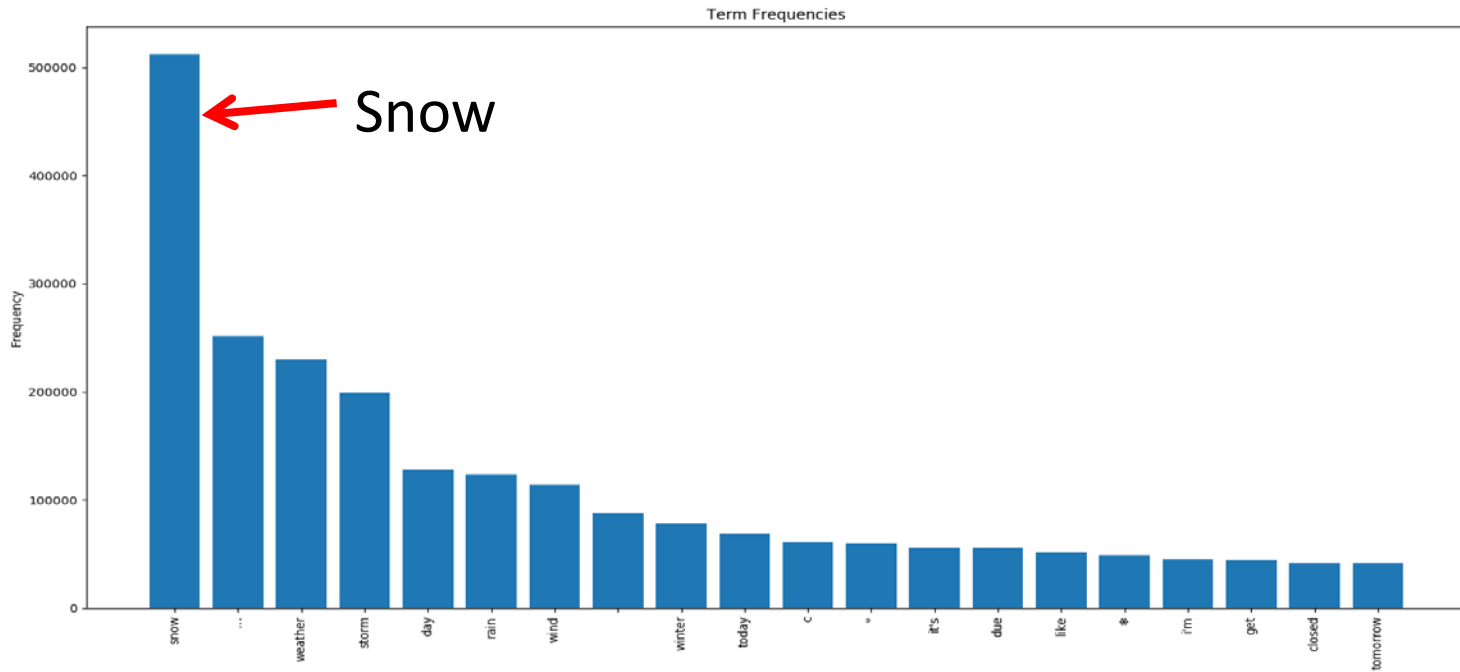
Manhattan

March 2017 snow event

Manhattan

~Midnight – 6 am

March 2017 snow event

Frequency of words in tweets

	Snow	Weather	Storm	Rain	Wind	❄	🦌
Global	512,414	229,836	198,798	123,773	113,915	48,789	
U.S. point location only	14,094	4,362	1,850	4,644	9,778	1,686	250

Term Frequencies

Snow

August 2017 Hurricane Harvey
Tweets in GeoCollaborate

StormCenter's
GeoCollaborate

Attributes (1 of 5)

time = Tue Aug 29 01:17:12 +0000
2017
latitude = 29.9731
longitude = -93.9967
tweet = The new model puts
#Harvey2017 2.0 right on top of us by
midday Wednesday. #SETX @
Nederland, Texas https://t.co
/JlTqUVwZw3
___OBJECTID = 20

Zoom to
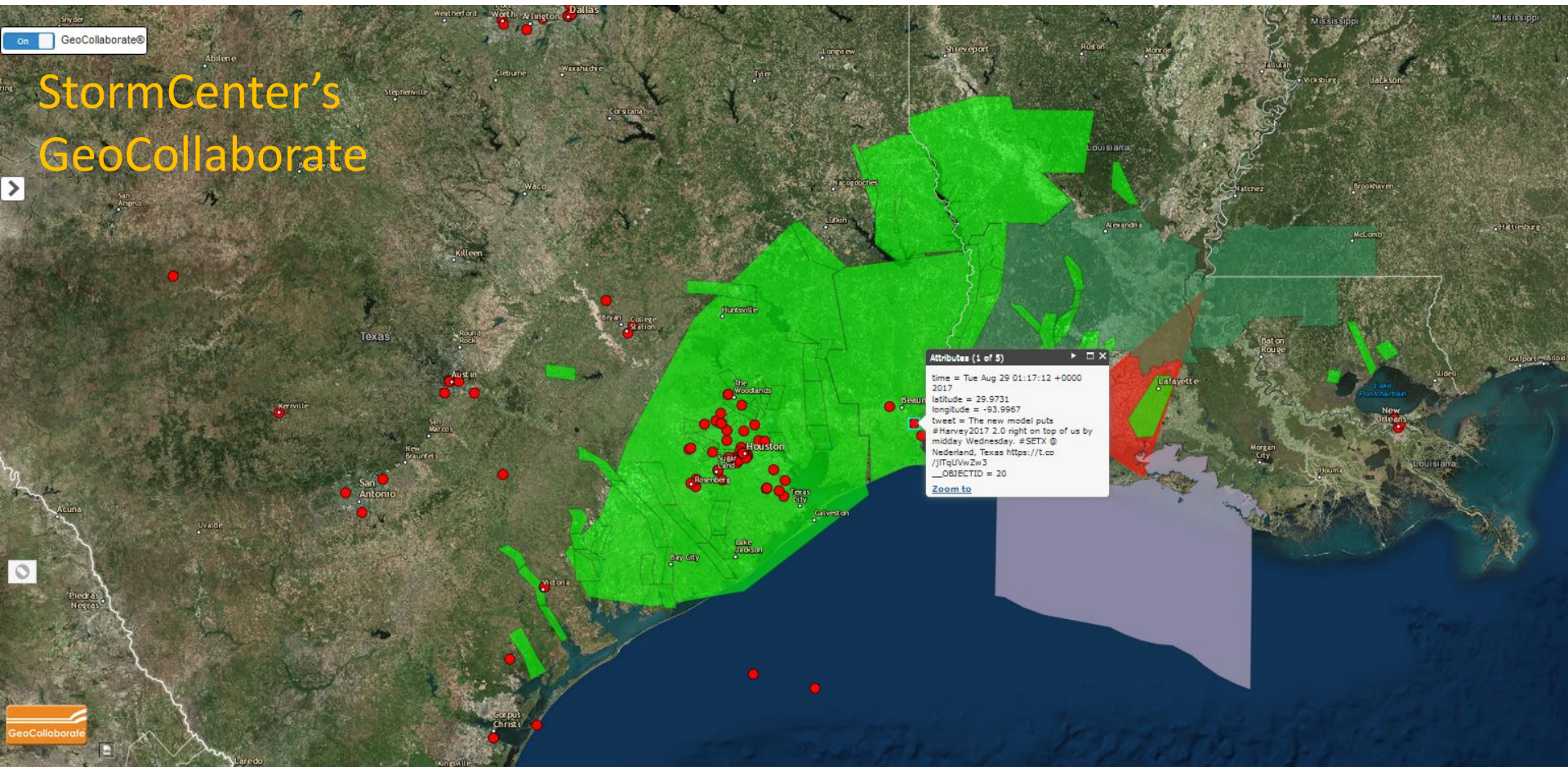
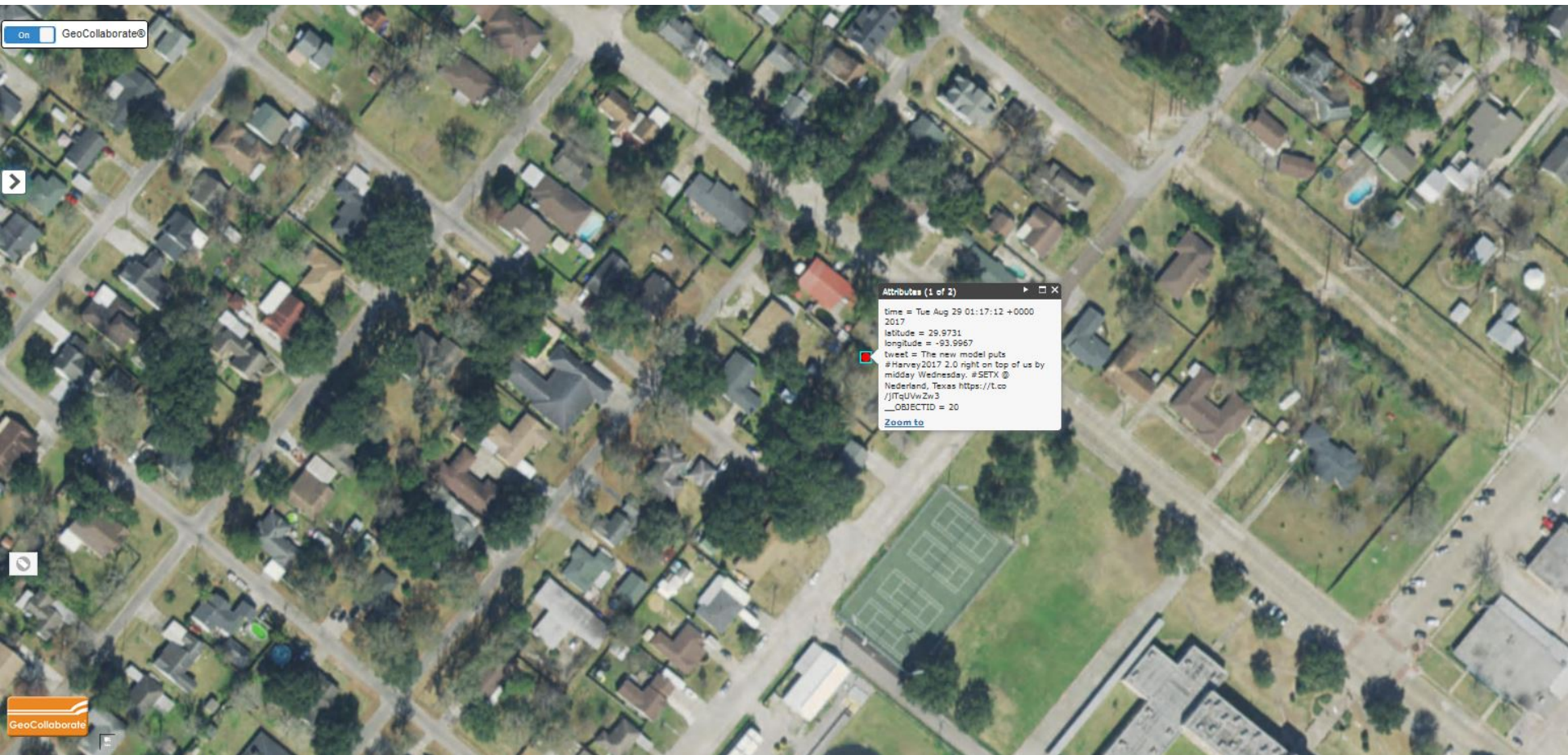# August 2017 Hurricane Harvey
Tweets in GeoCollaborate

Summary

➢Infrastructure is generic, i.e., not specific to a given measurement, social medium, or satellite mission.

➢Twitter data have potential for earth science applications.
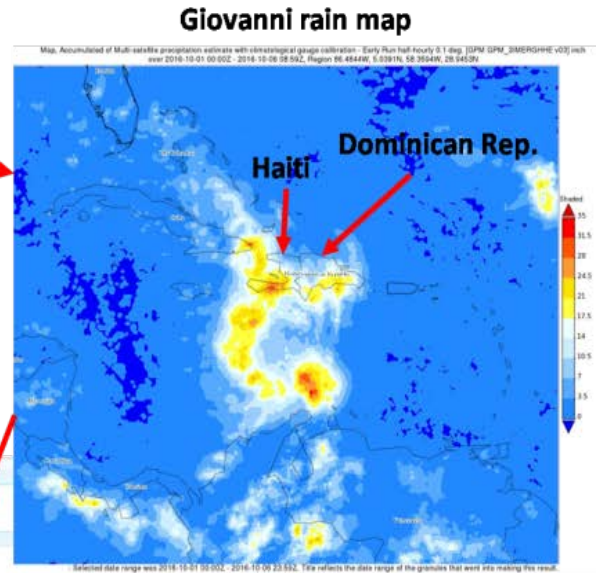
Questions?

Extras

Filter and extract "rain" tweet (Oct. 7, 2016) about Hurricane Matthew.
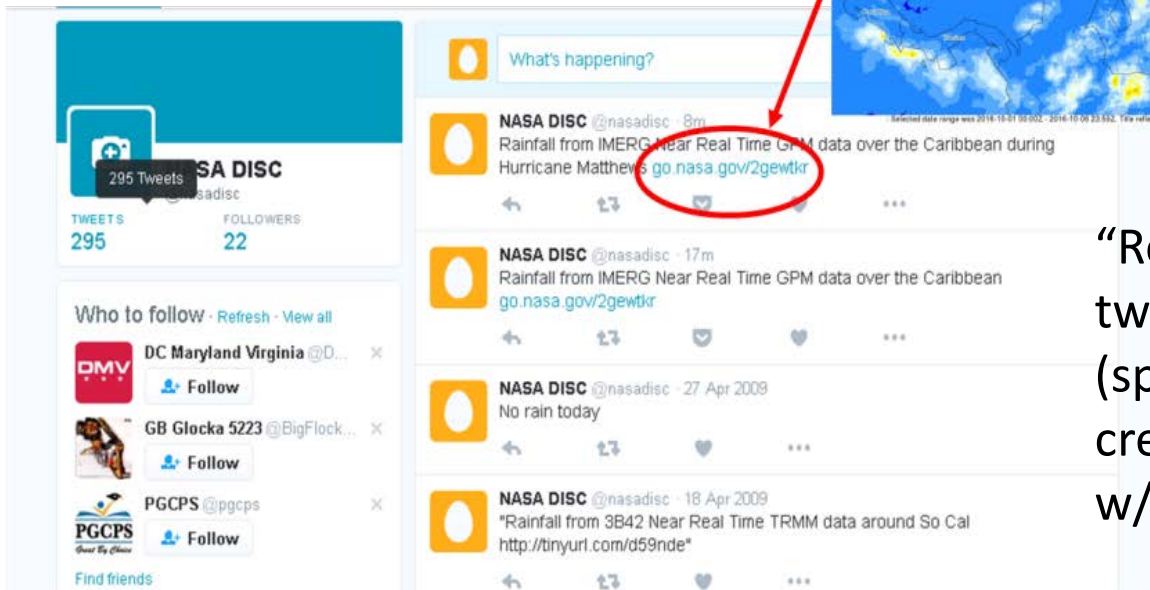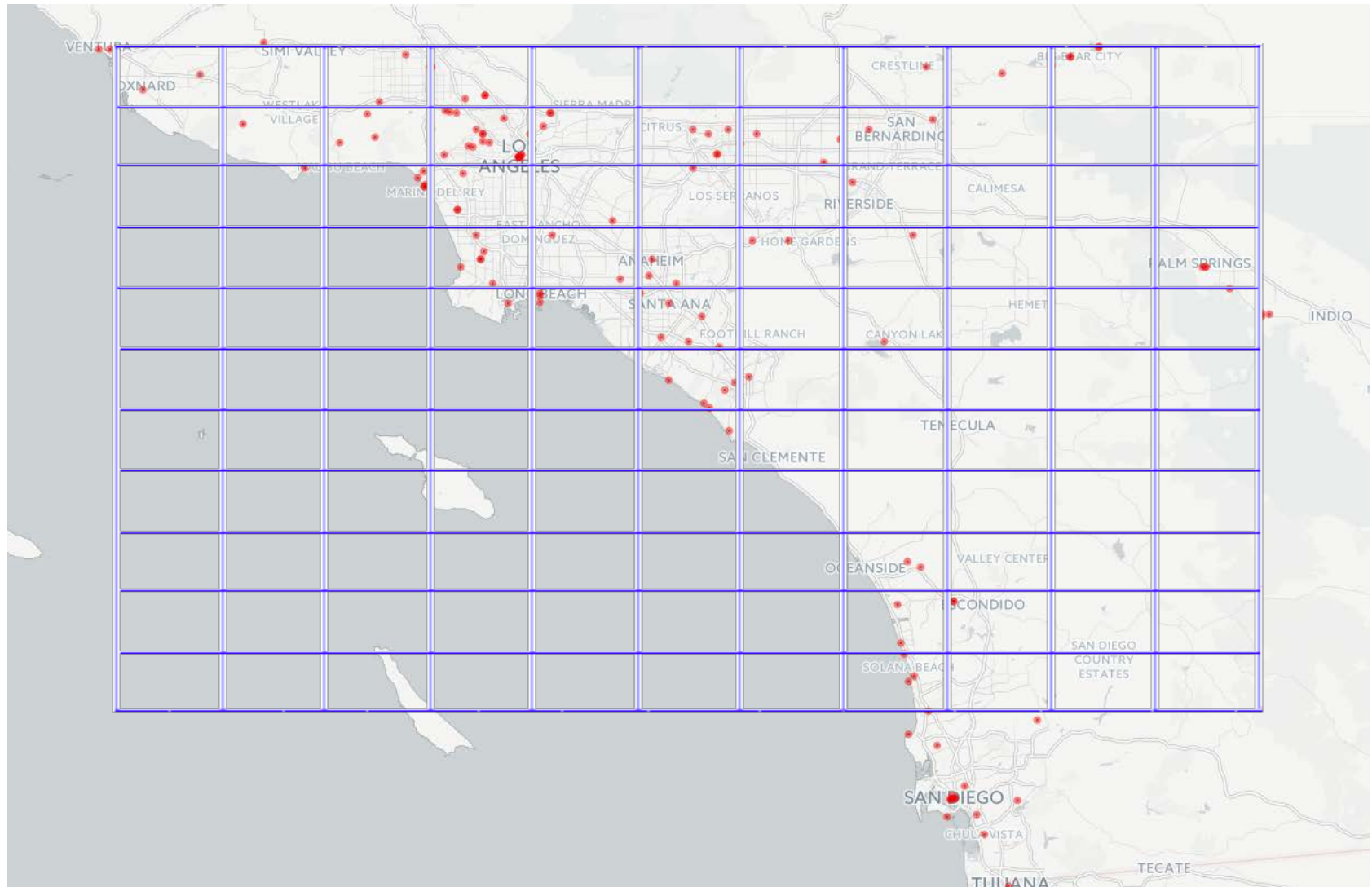

Generate rain map from GPM, using NASA Giovanni.

"Reply" to "rain" tweet by tweeting to @NASADISC (special Twitter account created for the experiment) w/ link to rain map.

Managing tweet data

August 2017 Hurricane Harvey
Number of tweets collected

Start: 2017-08-29 00:33:21 – End: 2017-08-29 09:36:02

	Total # tweets	# tweets w/ geo-location	# tweets w/ geo-tag (place)
Global	1,571,234	6,497	84,103
U.S.		4,010	78,906

August 2017 Hurricane Harvey
Distribution of tweets